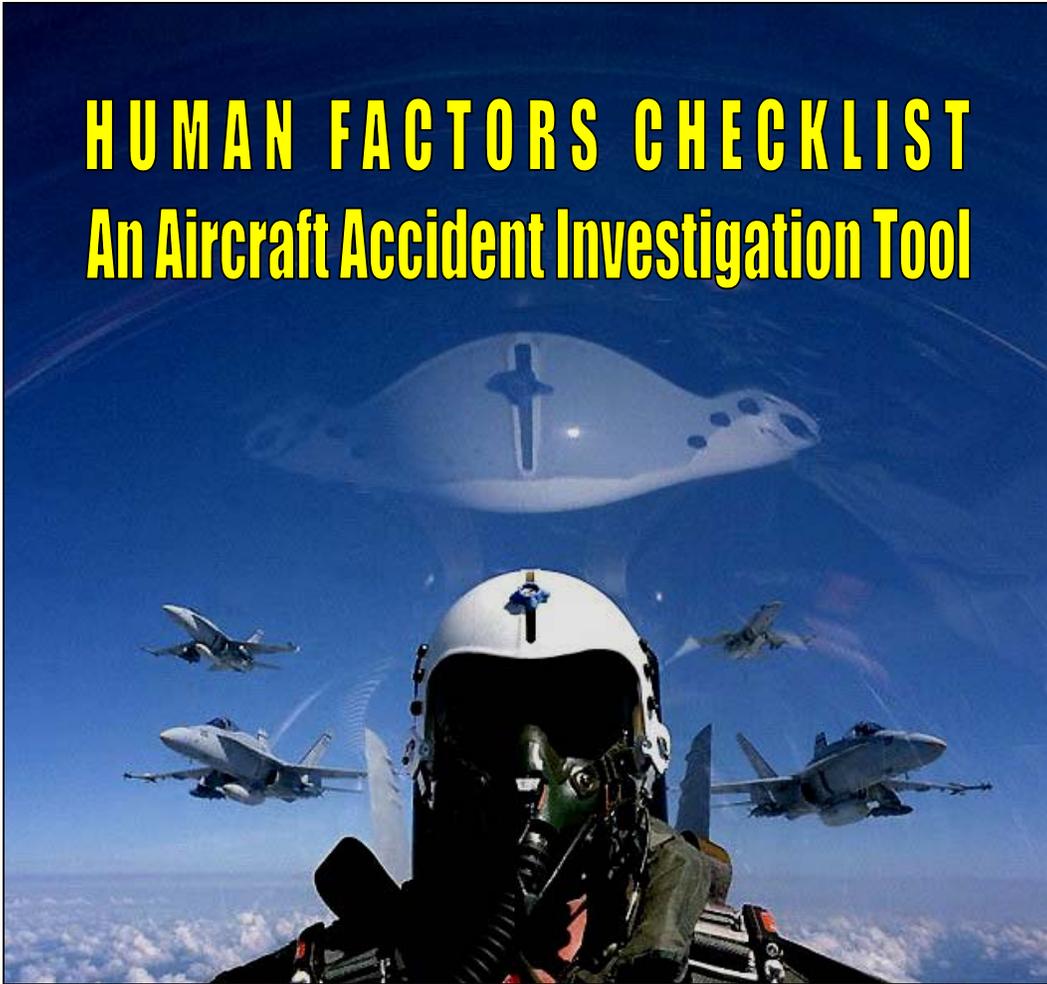


# HUMAN FACTORS CHECKLIST

## An Aircraft Accident Investigation Tool



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# HUMAN FACTORS CHECKLIST

## 1. SENSORY- PERCEPTUAL FACTORS

- Misjudged distance, clearance, altitude, speed, etc.
- False perception due to visual illusion

### *Conditions that contribute to impaired Visual Performance:*

- 1) Featureless terrain (desert, dry lake bed, water)
- 2) Dark/low visibility
- 3) Black hole approach (VFR, dark landmass, lights against rising terrain)
- 4) No/false horizon (unreliable visual attitude reference)
- 5) Mountain terrain or sloping runway
- 6) Helicopter rotor downwash effects (cascading water on windscreen, ripples on water, grass or sand, white/brown out)
- 7) Anomalous light effects (e.g. pulsating or oscillating lights; flicker vertigo)
- 8) Low contrast target/object to background or poor illumination
- 9) Looking into bright sun/moon/light, or shadowed area

- False perception due to vestibular illusion

#### Types:

- A. Coriolis-cross coupling (spinning sensation due to vestibular overstimulation)
- B. Somatogravic (gravity induced false pitch up or down sensation)
- C. Somatogyral (false sensation of angular rotation)
- D. G-excess (error in perceiving actual angle of bank)

- Spatial Disorientation/Vertigo

#### Types:

- A. Type I: Unrecognized or “misoriented” (loss of attitudinal orientation without awareness)
- B. Type II: Recognized (Vertigo or the “leans”)
- C. Type III: Incapacitating (e.g. G-induced vestibular-ocular decoupling)

### *Conditions that affect sense of Body Position or Aircraft Attitude:*

- 1) Loss of visual cues/attitude reference (especially with no natural horizon)
- 2) Acceleration related illusions (G-force and centrifugal force illusions)
- 3) Adverse medical or physiological condition (alcohol/drug effects, hangover/dehydration, fatigue, other)

- Loss of Situation Awareness (SA)

#### Types:

- A. Geographic disorientation (off navigation route or map/lost)
- B. General loss of SA (did not perceive hazardous condition)
- C. Erroneous situation assessment (misinterpreted situation or condition)
- D. Failed to predict/anticipate changing conditions
- E. False hypothesis/confirmation bias (persistent false perception or misconception of situation)

- Attention failure (did not monitor or respond when correct information was available)

**Types:**

- A. Missed flight checklist items, callout, or crew challenge.
- B. Failed to monitor flight progress or maintain instrument scan.
- C. Failed to respond to communication or warning input.
- D. Control action errors (motor response SLIP or memory LAPSE)
  - a. Forgot to set/move/reset switch (Lapse)
  - b. Unintentional activation (Slip)
  - c. Control substitution error (Slip)
  - d. Control reversal error (Slip)
  - e. Control adjustment/precision error (Slip)

**Conditions that influence Attention and Situation Awareness:**

- 1. Inattention (focused on information unrelated to cockpit tasks/flying)
- 2. Channelized or task fixated (psychological perceptual narrowing)
- 3. Distraction (by internal/mental preoccupation, or by external event)
- 4. Task overload (excess tasking with/without mission performance time pressure)
- 5. Cognitive workload (problem-solving concentration or information overload)
- 6. Habituation (old/previous learned habit interference)
- 7. Excess aircrew stress or fatigue level.
- 8. Excess mission tasking or workload.
- 9. Inadequate briefing or poor flight preparation.
- 10. Inadequate training or experience for mission.
- 11. Negative learning transfer (e.g. transitioning to new aircraft).
- 12. Adverse weather/meteorological conditions.
- 13. Adverse cockpit environmental conditions (temperature, vibrations, etc.)
- 14. Tactical situation or display information overload.
- 15. Low aircrew motivation and poor flight vigilance.
- 16. Poor cockpit design (control/display location or data format)

**2. MEDICAL AND PHYSIOLOGICAL FACTORS**

- Self-medicated (without or against medical advice) or taking nutritional supplements
- Flew under influence of drugs/alcohol
- Flew with cold or flu (or other known illness)
- Flew while under excess personal stress or fatigue
- Flew without adequate nutrition (skipped meals)
- Experienced G-induced loss of consciousness (G-loc) or G-excess in flight
- Experienced hypoxia or hyperventilation during flight
- Other medical or physiological condition (Specify):

Conditions that may lead to adverse Medical/Physiological State:

1. Mission fatigue (on job/duty over 12 hours; late night or early morning operations between 0200-600)
2. Cumulative fatigue (excess physical or mental workload, circadian disruption, or sleep loss)
3. Cumulative effects of personal or occupational stress (exceeds personal stress coping limits)
4. Emergency flight condition/workload transition (normal to emergency situation)
5. Medical or physiological pre-conditions (preceding state of health, fitness level, hangover/dehydration, etc.)

**3. KNOWLEDGE OR SKILL FACTORS**

- Showed inadequate knowledge of systems, procedures, etc. (*Knowledge-based error*)
- Poor flight control/airmanship or poor accuracy/precision of flight maneuvering (*Skill-based error*)
- Misuse of procedures or incorrect performance of cockpit tasks (*Rule-based error*)

**Types:**

- A. Failed to perform required procedure(s)
- B. Used wrong procedure or rule(s)
- C. Missed step(s) in a prescribed sequence
- D. Performed steps out of sequence

Conditions that lead to Poor Operational Performance:

1. Below required proficiency or currency standards
2. Showed poor performance trend and/or documented flight aptitude deficiencies
3. Low flight hours (total flight hours, or hours in-type aircraft)
4. Lacked essential training for specific task(s)
5. Lacked recent mission or flight conditions (instrument, night, weather, etc.) experience
6. Transition pilot (learning new aircraft system)
7. Considered Marginal Aviator (documented history of poor performance or flight violations)

**4. PERSONALITY AND SAFETY ATTITUDE**

- Showed pattern of overconfidence about flying ability
- Showed pattern of excess motivation to achieve mission
- Exhibited anger/frustration on the job
- "Hot Dogging" on mishap flight and/or exhibited stress related "acting out" behavior
- Was too assertive or non-assertive for situation
- Lacked confidence to perform tasks/mission(s)
- Yielded to social pressure to perform in hazardous situation (from command or peers)

**Contributing Factors leading to Poor Safety Attitude:**

1. Habitual high risk taker (personality-driven with previous history)
2. Pattern of overconfidence (bloated self-image)
3. Considered Marginal or High Risk Aviator (documented history of poor performance or flight violations)
4. Excess motivation (did not know limits)
5. Poor command climate/safety culture (lack of adequate supervision)

**5. JUDGEMENT- RISK DECISION FACTORS**

- Knowingly accepted a high-risk situation
- Misjudged actual risks of mission (complacency)
- Did not monitor flight progress/conditions (complacency)
- Used incorrect task priorities
- Knowingly deviated from safe procedure (imprudence)
- Intentionally violated safety standard or regulation
- Willfully ignored warning input (from human or display system)
- Knowingly exceeded personal limits
- Knowingly exceeded published aircraft limits
- Knowingly exceeded prescribed mission profile/parameters
- Yielded to social pressure (command or peers)

**Conditions that can predispose making inappropriate Risky Judgments:**

1. Considered a "hotdog" pilot (reputation) or High Risk Aviator (documented)
2. Excess Motivation (did not know limits)
3. Not handling "life stress" (anger/frustration; not coping)
4. Too assertive or non-assertive (Interpersonal Style)
5. Influenced by poor command climate/safety culture (lack of adequate supervision)

**6. COMMUNICATIONS/CREW COORDINATION FACTORS**

- Inadequate mission plan/brief or preflight
- Failed to communicate plan/intentions
- Failed to use standard/accepted language
- Misunderstood or unacknowledged communication
- Inadequate crew challenges or crosscheck
- Crewmember intentionally withheld vital safety data
- Pilot in command failed to lead and/or delegate
- Pilot in command failed to use all available resources
- Interpersonal conflict/crew argument during flight

**Conditions that can lead to Poor Communication/Coordination:**

1. Inadequate training in communications/crew coordination.
2. Inadequate standard operating procedures for use of crew resources.
3. Weak support from command for aircrew coordination doctrine.

4. **Aircrew/cockpit rank/experience gradient present**
5. **Command safety culture does not support a "crew concept".**

## **7. DESIGN/SYSTEM FACTORS**

- Used wrong switch/lever or control**
- Misread or misinterpreted instrument reading**
- Could not reach or see control**
- Could not see or read instrument or indicator**
- Failed to respond to warning signal**
- Selected/used wrong avionics system operating mode (mode confusion)**
- Over-reliance on automated system (automation complacency)**

### **Conditions that contribute to Design-Induced Aircrew Errors:**

1. **Poor primary aircraft controls or display arrangement**
2. **Inadequate primary display data or data format**
3. **Hard to read instrument data (legibility, glare, lighting)**
4. **Incompatible cockpit control-display activation, or aircraft response mapping**
5. **Inadequate hazard advisory or warning display**
6. **Poor cockpit design layout (controls/displays outside vision/reach envelope)**
7. **Poor human-computer-display interface/usability (error prone design)**
8. **Poor system instructions/documentation**
9. **Inadequate aviation system support or facilities (navigation aids, airport, traffic control)**
10. **Nonstandard cockpit layouts (invitation to negative habit transfer)**
11. **Inappropriate type or level of automation, or excess operational mode complexity**

## **8. SUPERVISORY FACTORS**

- Inappropriate schedule/crew assignment**
- Failed to monitor crew rest/duty allowance**
- Failed to establish adequate standards**
- Failed to monitor compliance to standards**
- Failed to monitor crew training/qualifications**
- Failed to screen/remove known high-risk aviator**
- Failed to establish/monitor quality standards**
- Intentionally violated or directed other(s) to violate a standard, rule or regulation**
- Command failed to correctly assess or perceive actual mission risks, with respect to:**

- A. **Environmental hazards/operating conditions**
- B. **Mission tasking and aircrew skill level**
- C. **Aircraft and equipment limitations**

**Conditions leading to Supervisory Failures:**

- 1. Excess operations tempo/organizational workload (imposed by command or imposed by chain of command).**
- 2. Poor command climate/safety culture, lax safety supervision.**
- 3. Inadequate standards and/or low performance expectations.**
- 4. Command did not provide adequate resources to support safe mission accomplishment.**
- 5. Command did not adequately train the mishap pilot or crew.**
- 6. Commanders did not set a good example, or set a bad example.**
- 7. Supervisors did not provide adequate commitment or emphasis on safe operations.**
- 8. Command has poor communications up/down command chain.**
- 9. Command has no system or weak system for management of high-risk aviator.**
- 10. Command has weak process or procedures for operational risk management.**
- 11. Command did not provide adequate Aeromedical or Human Factors Training.**
- 12. Command did not ensure sufficient involvement of flight surgeon at their unit.**
- 13. Command did not establish, or enforce, acceptable flight physiology standards.**

## Appendix A.

### **Characteristics of the “High Risk” Aviator**

**Note:** This was formerly known as the “failing” aviator syndrome. These characteristics are meant to act as a guide. Not every characteristic will be seen in a “High Risk” Aviator.

#### **1. Below Average Nugget or Transitional Aviator:**

##### **Key Characteristics:**

- Behind peers in progression
- Fails NATOPS exams or check rides
- Poor knowledge of procedures
- Lacks flying skills or mission proficiency
- Shows poor headwork or judgment
- Lacks confidence in ability
- Weak aircrew coordination/communication skills

#### **2. Overconfident Senior Aviator:**

##### **Key Characteristics:**

- Has been out of the cockpit or is not flying enough
- Has “been there, done that” attitude
- Relies on past experiences instead of proficiency
- Does not adhere to NATOPS or standards
- Uses rank inappropriately to “bend” the rules
- Fails to recognize own limits; denies being wrong or errors
- Intimidates cockpit crew (uses cockpit gradient to own advantage)
- Poor aircrew coordination

#### **3. “Best” Pilot/Aviator/Aircrewman:**

##### **Key Characteristics:**

- Typically a “good stick” but overestimates ability
- May be highly regarded by command or peers
- Consistently pushes the aircraft to envelope without operational necessity
- Completes mission at “any” cost
- Lacks judgment and accurate perception of mission risks
- Violates NATOPS and/or SOP
- Thinks rules apply only to the “average” aviator
- Talks down to other pilots
- Prefer high risk missions and conditions to preserve “best pilot” image
- Low regard for aircrew coordination; takes minimal input from other aircrew members

#### **4. Consistent Poor Performer:**

##### **Key Characteristics:**

- History of below average performance
- May be well liked and /or excel at ground duties
- Barely meets or shows slow qualification progress
- High rate of flight snivels
- Easily distracted and task overloaded
- Frequently suffers loss of situational awareness
- Does not seem to improve or come up to peer level
- Usually behind peers in progression
- Lacks self-confidence
- Excessive dependence on other aircrew members

Ref: COMNAVAIRPACINST 5420.2B/  
COMNAVAIRLANTINST 5420.5C/  
COMNAVAIRESFORINST 5420.2

## Appendix B. Crew Resource Management

There are seven basic skill areas that make up Crew Resource Management ([CRM](#)). These are as follows:

1. ADAPTABILITY/FLEXIBILITY (AF)
2. ASSERTIVENESS (AS)
3. COMMUNICATION (CM)
4. DECISION MAKING (DM)
5. LEADERSHIP (LD)
6. MISSION ANALYSIS (MA)
7. SITUATIONAL AWARENESS (SA)

### ADAPTABILITY/FLEXIBILITY (AF)

#### WHAT IS ADAPTABILITY/FLEXIBILITY?

Adaptability/Flexibility refers to the ability to alter a course of action when new information becomes available.

#### SITUATIONS THAT REQUIRE QUICK ADAPTATION

##### When:

- ❖ Unbriefed Situations Arise
- ❖ A Routine Mission Becomes an Emergency
- ❖ Transitions Occur
- ❖ A Crew Member is Incapacitated
- ❖ Interactions are Strained

#### MAINTAINING ADAPTABILITY / FLEXIBILITY

- Anticipate Problems
- Recognize and Acknowledge any change
- Determine if an SOP or Habitual Response is Appropriate
- Offer alternative solutions
- Provide and Ask for Assistance
- Interact Constructively with Others

#### SETTING THE TONE FOR ADAPTABILITY/FLEXIBILITY

- Establish an open, professional atmosphere
- Ensure the crew understands the mission

### ASSERTIVENESS (AS)

#### WHAT IS ASSERTIVENESS?

The willingness/readiness to actively participate, state and maintain a position, until convinced by the facts that other options are better. This requires the initiative and the courage to act. This will often times push you beyond your “comfort” level.

#### COMFORT LEVEL

Comfort level is the degree to which you feel comfortable with what is happening, while taking into account that flying a mission can be dangerous and demanding. Whenever comfort level is exceeded, "Speak Up".

### Behavior Continuum

PASSIVE	ASSERTIVENESS	OVER AGGRESSIVENESS
Overly courteous	Active Involvement	Domination
"Beats around the bush"	Readiness to take action	Intimidation
Avoids Conflicts	Provide useful information	Abusive / Hostile
"Along for the ride."	Makes suggestions	

#### BARRIERS TO ASSERTIVENESS

- Position of Authority
- Experience
- Rank
- Lack of Confidence
- Fear of Reprisal

### COMMUNICATION (CM)

#### WHAT IS COMMUNICATION?

Communication is the clear and accurate sending and receiving of information, instructions, or commands, and providing useful feedback.

#### TYPES OF COMMUNICATION

- ❖ Verbal (Involves Words)
  - ❖ Spoken
  - ❖ Written
- ❖ Non-Verbal (Everything but Words)
  - ❖ Gestures
  - ❖ Voice Intonation

#### PROCESS OF COMMUNICATION

1. Sender Conveys ideas or information to others
2. Receiver hears or takes in information and provides feedback

#### SENDER'S RESPONSIBILITIES:

- Communicate in Appropriate Mode
- Verbal versus Non-verbal
- Convey Information Accurately and Concisely
- Provide Information at Appropriate Time
- Request Verification or Feedback

#### RECEIVERS RESPONSIBILITY:

- Actively Listen
- Active Vice Passive Role
- Take action as a result of Communication
- Answer, or Respond, to Communications
- Ask for Clarification of Unclear Communication

**BARRIERS TO COMMUNICATION**

- ❖ Noise
- ❖ Rank/Experience
- ❖ Task Overload
- ❖ Gender
- ❖ Attitudes
- ❖ Culture

**DECISION MAKING (DM)**

**WHAT IS DECISION MAKING?**

Effective decision-making refers to the ability to use logical and sound judgment to make decisions based on available information. This includes:

- ❖ Assessing the problem
- ❖ Verifying information
- ❖ Identifying solutions
- ❖ Anticipating consequences of decisions
- ❖ Informing others of decision and rationale
- ❖ Evaluating decisions

**Factors Which Promote Good Decision Making:**

- Teamwork
- Extra time to make a decision
- Alert crew members
- Decision strategies and experience

**A Decision Making Strategy for Troubleshooting:**

- Identify all the symptoms
- Make a hypothesis as to the possible cause
- Test your hypothesis
- Appropriate remedies

**Barriers to Good Decision Making:**

Barrier	How to Overcome
Time	Use SOP's and select the best decision using available information
Inaccurate or ambiguous info	Cross-check info
Pressure to perform	Evaluate the rationale for making a decision
Rank Difference	Use assertive behaviors

**Decision Strategy for Risk Assessment: (AESOP Model)**

Once a hazard has been detected, evaluate it to determine its potential effect on the planned flight by considering its impact on the:

- Aircraft
- Environment
- Situation
- Operations
- People

The analysis should consider the crew's relative ability to cope with changes in each of the five basic elements listed in the AESOP model.

**Remember:**

\* Good decisions optimize risk management and minimize errors, while poor decisions can increase them. Poor judgment or decision-making is a leading cause of failure to complete missions and of mishaps. Each decision affects your future options.

## **LEADERSHIP (LD)**

### **WHAT IS LEADERSHIP?**

The ability to direct and coordinate the activities of other crewmembers or wingmen, and to encourage the crew to work together as a team.

### **TYPES OF LEADERSHIP:**

1. **DESIGNATED LEADERSHIP**
  - Responsible
  - Makes Final Decisions
  - Normal Mode of Leadership
2. **FUNCTIONAL LEADERSHIP**
  - Leadership by Knowledge or Expertise
  - Occurs when the Need Arises

### **RESPONSIBILITIES OF LEADERSHIP**

- Crew Performance
- Direct Actions
- Ask for Assistance

### **TRAITS OF AN EFFECTIVE LEADER**

- ❖ Respected
- ❖ Decisive
- ❖ Delegates Tasks
- ❖ Provides Feedback
- ❖ Leads by Example
- ❖ Keeps Crew Informed
- ❖ Open to Suggestions
- ❖ Builds Team Spirit
- ❖ Directs and Coordinates Activities
- ❖ Maintains a Professional Atmosphere
- ❖ Knowledgeable of how to do the Mission

## **MISSION ANALYSIS (MA)**

### **WHAT IS MISSION ANALYSIS?**

Mission Analysis refers to the ability to develop short term, long-term and contingency plans, as well as to coordinate, allocate and monitor crew and aircraft resources.

### **PHASES OF MISSION ANALYSIS INCLUDE:**

- 1) Prepermission/Preflight
- 2) Inflight
- 3) Postflight

**PRE-MISSION ANALYSIS involves:**

- **Planning**
- **Preparation**
- **Briefing**

**Characteristics of an Effective Brief**

- **Professional in Delivery**
- **Stays Focused on the Desired Mission Outcome**
- **Assign Responsibilities to Members**
- **Interactive**
- **Complete**

**IN-FLIGHT MISSION ANALYSIS involves:**

- **Short-term Planning**
- **Monitoring Mission Progress**
- **Identifying and Reporting Challenges or Changes**

**POST-MISSION ANALYSIS is:**

- **Selective Review of Mission Outcome and Events**
- **Interactive**
- **Timely**

## **SITUATIONAL AWARENESS (SA)**

### **WHAT IS SITUATIONAL AWARENESS?**

Situational Awareness refers to the degree of accuracy by which one's perception of his current environment mirrors reality.

### **PERCEPTION VERSUS REALITY**

- **View of Situation**
- **Incoming information**
- **Expectations & Biases**
- **Incoming Information versus Expectations**

### **FACTORS THAT WILL REDUCE SITUATIONAL AWARENESS**

- **Insufficient Communication**
- **Fatigue / Stress**
- **Task Overload**
- **Task Underload**
- **Group Mindset**
- **"Press on Regardless" Philosophy**
- **Degraded Operating Conditions**

Appendix C.

# HUMAN FACTORS RISK MANAGEMENT CHECKLIST

## 1. SENSORY- PERCEPTUAL FACTORS

- Ensure Currency in Physiological Qualifications.
- Provide Continued Education for ASO and AMSO.
- Promote Flight Surgeon Involvement at unit level.
- Establish Weather (IMC) Go/No Go Decision Criteria.
- Establish Standard Procedures for Night Low Altitude, and Other Known High-Risk Missions.

## 2. MEDICAL AND PHYSIOLOGICAL FACTORS

- Document Medical/Physiological Qualifications.
- Provide Procedure to Remove, Disqualify, or Creatively Schedule Aviator Under High Stress.
- Publish Human Factors' Hazard Reports of Physiological and Behavioral Incidents.
- Use Aeromedical Team Resources.
- Provide Written Instructions on Use of Flight Gear, Oxygen Equipment, Exposures Suits, etc.
- Include Flight Surgeon on Human Factors Boards and Committees.
- Use Human Resource and Social Services for Family Crisis and Drug or Alcohol Abuse.

## 3. KNOWLEDGE OR SKILL FACTORS

- Establish Proficiency and Currency Standards.
- Enforce Standards in Equitable Manner.
- Assess Training Progress Against Standards.
- Document Training Results (Performance).
- Have Remedial Training Program in Place.
- Remove the Persistent Marginal Performer.

## 4. PERSONALITY AND SAFETY ATTITUDE

- Identify and Remove Chronic High-Risk Taker.
- Use Judicious Crew Assignment/Scheduling.
- Conduct Periodic Human Factors Reviews.
- Use Human Factors Board to Help Manage High-risk taker. Go to FNAEB/FFPB if needed.

## **5. JUDGEMENT- RISK DECISION FACTORS**

- Enforce Use of Squadron Go/No Go Criteria.
- Commanders Illustrate Judgment By Example.
- Provide Crew Judgment Training and Evaluation. (Teach Headwork Too.)
- Monitor and Correct High-Risk Behaviors.
- Encourage Development of Personal SOP (Go/No Go Flight Readiness Decision).

## **6. COMMUNICATIONS/CREW COORDINATION FACTORS**

- Establish Communications Protocol/Standards.
- Provide Aircrew Coordination (team) Training.
- Construct Mission Task SOP's (Crew Tasking).
- Brief and Debrief Crew Coordination Events.
- Use Specific Simulator or Flight Scenarios to Teach Crew Concept/Coordination Tasks.

## **7. DESIGN/SYSTEM FACTORS**

- Train and Test Aircraft Systems Knowledge.
- Ensure Pilots Know and Fly "By the Book".
- Identify Potential Aircraft Performance Limits and Tolerances.
- Identify Faulty Cockpit Layout, Control, and Display Designs.
- Communicate to Aircrews High-Risk Areas Due to Aircraft Performance Limits, and any Cockpit Design Deficiencies.
- Conduct Periodic "Blind Cockpit Tests".
- Publish Human Engineering Hazreps and Recommend Design Changes as Needed.
- Monitor/ Improve Maintenance and Quality Control Procedures.

## **8. SUPERVISORY FACTORS**

- Establish Positive Command Climate.
- Include Safety Advocacy as Organizational Goal.
- Set Clear Performance Standards.
- Monitor Compliance to Standards and Procedures.
- Know Your People.
- Keep Open Door Policy, Walk Around and Listen.
- Swiftly Correct Poor Performance and Non-Compliance to Standards.
- Acknowledge and Reward Safe Behavior.
- Conduct Top-down, and Contingency, Risk Management
- Leadership Should Set Example For Safe Operations.